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BRIEFER ARTICLES.

A MINNESOTA SPECIES OF TUBER.

(WITH THREE FIGURES)

THE Tuberaceae, which occur abundantly in Europe, have as yet been but sparingly reported from North America. In Saccardo's Sylloge¹ *Tuber macrosporum* Vittad. is reported from Pennsylvania. No authority is cited, and it has been impossible to find the original report. *Terfezia leonis* Tul., a member of the closely allied order Elaphomycetaceae, is reported by Rev. A. B. Langlois² from north-western Louisiana, and has been distributed by Ellis in his *North American Fungi*.³ Dr. R. Thaxter reports to me that *Tuber dryophilum* Tul. is common in parts of New England, and that other tuberaceous fungi occur there, though not in abundance. The only other report of the occurrence of tuberaceous fungi in North America is from California, where Harkness⁴ has found a large number of species of Tuberaceae, including thirteen species of the genus *Tuber*, seven of which he describes as new.

In view of these facts the occurrence of a species of *Tuber* in the interior of the continent, and in the most northern part of the United States, is of more than ordinary interest.

On March 11, 1903, specimens of a species of *Tuber* were collected by Mr. H. L. Lyon in the vicinity of Minneapolis, Minn. The locality where the fungi were found is a steep bank with southern exposure. The soil is a stiff calcareous clay, covered with a shallow layer of leaf-mold. At the time of collection a week of warm weather had melted the winter's snow and thawed the soil to the depth of several inches, but the clay subsoil was still frozen hard, and the surface soil had been soft for only a very few days.

The fungi were found in the leaf-mold about the base of a small group of basswood trees (*Tilia americana* L.). A further collection was

¹SACCARDO, P. A., Sylloge Fungorum 8: 887.

²Journal of Mycology 3: 10. 1887.

³ELLIS, J. B., and EVERHART, B. M., North American Fungi, second series, no. 1782.

⁴HARKNESS, H. W., California hypogaeous fungi. Proc. Cali. Acad. Sci. 8 Jy. 1899.

made two days later from the same locality, and in all about thirty specimens of the fungus were obtained. Search has been made under other trees in the same vicinity and elsewhere, but as yet no further localities have been found.

All the fungi collected were in a mature condition. There had hardly been time for their development this spring, though such forms as *Saccoscypha coccinea* Jacq. had already made their appearance. It

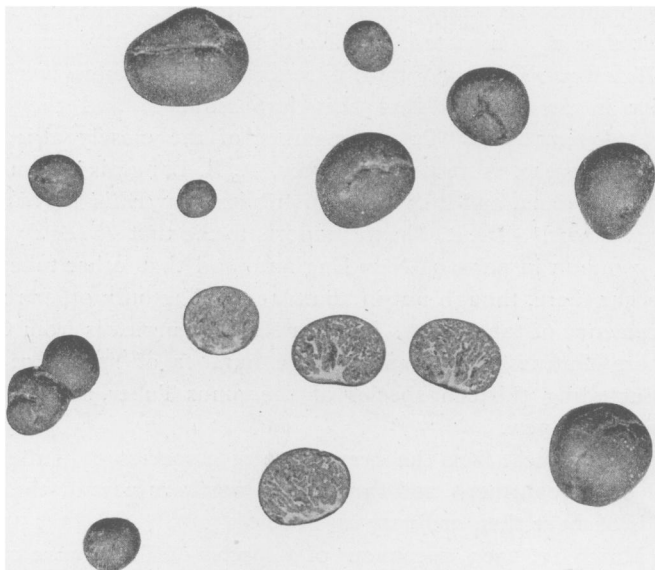


FIG. 1.—Group of the fungi, natural size. From a photograph.

seems probable that the ascomata of the truffle are formed in the late autumn, and lie over the winter in a practically mature state. They probably break down early in the spring. Of a number which were collected and placed in earth out of doors, the greater part are yet (March 26) in a good state of preservation, but though there has been very little warm weather since the date of their collection, and the ground has been covered with snow for a portion of the time, several of them are beginning to show signs of disintegration.

The fungi vary from 0.5–2^{cm} in diameter (*fig. 1*). The smaller ones are almost spherical, the larger of a somewhat irregular elliptical form. In one case two have evidently grown together during their formation, producing a peculiar dumb-bell shaped body.

Along one side of the fungus runs an irregular scar-like groove

which extends from one fourth to over one half way around the fruit body. In a few specimens this scar is interrupted, and in some it forks or branches somewhat, but it is usually unbranched and continuous. As the fungi lie in their natural position in the soil, this scar maintains no fixed position in relation to the surface of the ground, but is turned in various directions. The surface of the fungus is smooth, slightly pruinose, becoming finally very slightly and minutely areolate. The color is a light chestnut brown, which becomes blackish in spots as the gleba begins to break down. The fungi have a peculiar heavy but not disagreeable odor resembling that of "malted milk."

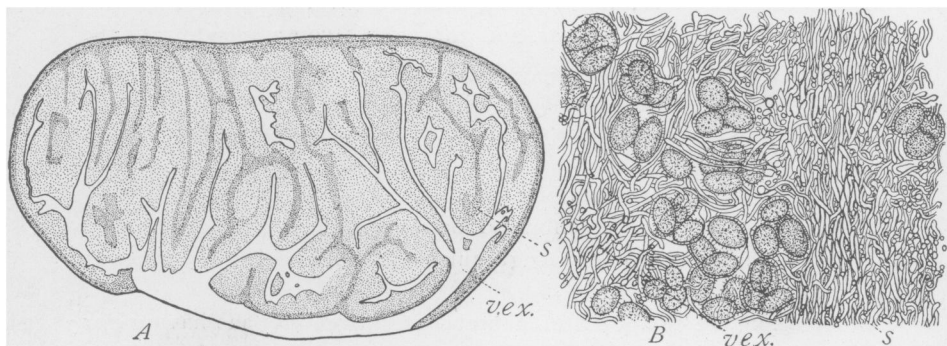


FIG. 2.—*A*, diagram of a longitudinal section passing through the scar, $\times 8$; *B* detail of a portion of the gleba, $\times 330$. *s*, septa; *v. ex.*, venae externae.

The peridium is rather thin, tough, and cartilaginous, composed of an outer opaque layer and an inner translucent layer. The outer layer of the peridium consists of hyphae having a general radial arrangement, but so closely intertwined as to have almost the appearance of pseudo-parenchyma. Within this is a thin layer of more loosely interwoven hyphae, running for the most part parallel to the surface of the fungus, and within this again a tissue composed of closely packed strands of hyphae running in many directions but all having a general concentric arrangement. The middle layer seen in microscopic preparations is not visible to the naked eye, and may be barely distinguished under the hand lens as a faint line between the outer and the inner peridium.

The gleba is violaceous brown, marbled with numerous veins of two kinds. The venae internae, or septa (*s*, *fig. 2*) are extensions of the inner layer of the peridium into the interior of the fungus. The

removal of the outer layer of the peridium exposes the origin of these septa as a network of numerous anastomosing lines covering all parts of the fungus except that immediately under the scar. In a section of the fungus the septa appear as labyrinthiform anastomosing veins of a dark translucent gray color, appearing in freshly cut specimens darker than the hymenial layer. In specimens preserved in alcohol they become white and are difficult to distinguish from the venae externae.

The venae externae (*v. ex.*, *fig. 2*) appear in a section of the fungus as branching veins of a pure white color, and of a cottony aspect under the hand lens. They alternate with the darker septa, ending blindly toward the periphery, but all communicate with a mass of similar tissue which underlies the scar, and through it communicate with the exterior. This mass of tissue is in places lined with a layer similar to the inner peridial layer, but in other places it abuts directly upon the hymenial tissue. In cases in which the scar is interrupted, the mass of underlying tissue is likewise interrupted, and the venae externae accordingly form more than one group.

The hymenial layer is embraced between these two types of veins. It is of a fleshy but somewhat granular texture, and of a violaceous brown color.

The septa are composed of densely interwoven hyphae having for the most part a radial course, though strands of hyphae running in other directions are not uncommon (*s.* *fig. 2, B*). The venae externae (*v. ex.*, *fig. 2, B*) consist of more loosely intertwined hyphae. The hymenial layer consists of closely packed asci interspersed with numerous hyphae, and forming no definite palisade layer. The hyphae of the venae externae and of the gleba are very large ($4-10\mu$ in diameter), septate, and sparingly branched. The asci are difficult to see clearly in a section, but may be easily seen in macerated material. They are 1-5-spored, but nearly all of them are 4-spored. The ascus is irregularly elliptical, averaging $45 \times 70\mu$ (p. sp.) and usually is furnished with a long pedicel. *Fig. 3, A* shows the most common form of ascus, but irregular asci like that shown in *fig. 3, B* and *C* are not uncommon.

The spores are large, elliptical, acutely echinulate, and of a slightly violaceous brown color. Spores occurring in 4-spored asci measure $15-25 \times 25-38\mu$, averaging $22 \times 35\mu$. The spores from one- and two-spored asci are larger, in the former case reaching $31 \times 48\mu$.

As will be seen by this description the fungus belongs to the genus *Tuber* (subgenus *Aschion*), and approaches very close to *Tuber rufum* Pico, and to *T. nitidum* Vittad. in general characteristics and micro-

scopic structure. It is less roughened externally than the typical form of *T. rufum*, and is distinguished from both of the species named by the color of the gleba and spores, by the more conspicuous veins, by the more densely crowded asci, by the slightly larger size and more elongated form of the spores, and apparently also by the greater extent of the scar-like external opening of the venae externae.

Tuber Lyoni n. sp.—Ascomata globose or irregularly elliptical, 0.5–2^{cm} in diameter, having a distinct scar-like groove along one side, smooth,

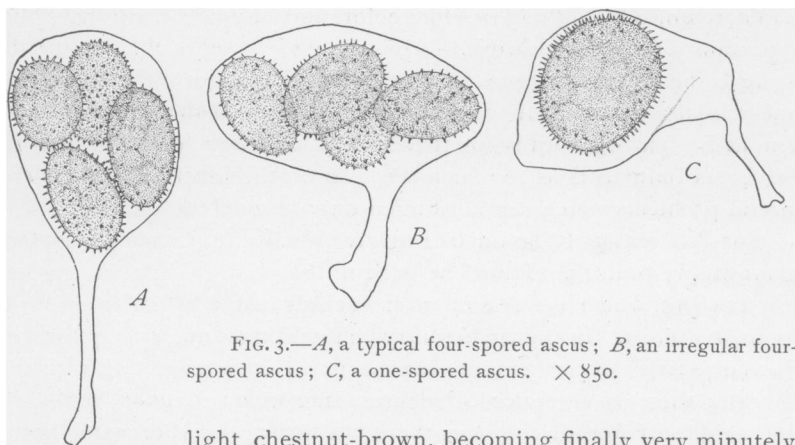


FIG. 3.—A, a typical four-spored ascus; B, an irregular four-spored ascus; C, a one-spored ascus. $\times 850$.

light chestnut-brown, becoming finally very minutely areolate and blackish. Peridium not thick, cartilaginous. Gleba violaceous brown, fleshy but somewhat granular. Septa arising from the peridium, numerous, anastomosing, labyrinthiform, dark translucent. Venae externae white, conspicuous, opening externally throughout the length of the groove. Asci pedicellate, 1–5- mostly 4-spored. Spores elliptical, acutely echinate, $15\text{--}31 \times 25\text{--}48 \mu$. Type specimens are deposited in the Herbarium of the University of Minnesota.

The occurrence of this form in Minnesota suggests that it is very possible that this and other species of tuberaceous fungi are not uncommon in the interior of North America. The conditions of their growth render their discovery almost entirely a matter of accident, and in the case of *Tuber Lyoni* the peculiar season at which it occurs may further account for the fact that it has not been hitherto discovered.—
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